

System and Method for Transmission Source Identification

[0001] The present application claims benefit of U.S. Non-provisional Application No. 13/886,112, filed May 2, 2013, entitled "System and Method for Transmission Source Identification," which application is hereby incorporated herein by reference.

5 TECHNICAL FIELD

[0002] The present invention relates to a system and method for communications, and, in particular embodiments, to a system and method for transmission source identification.

BACKGROUND

[0003] In a typical wireless network such as long-term evolution (LTE) network, a particular network device may receive transmissions from multiple other network devices. For example, a base station (BS) may receive uplink transmissions from multiple user equipment (UEs). Since each transmission may originate from multiple transmitters, a certain amount of signaling is required to distinguish each transmitter at the receiver. For example, in current cellular networks, the BS instructs each UE when to transmit and which resources to use during transmission, which implicitly identifies the UE during its transmission. As another example, in current 802.11 networks, stations (STA) append their unique medium access control (MAC) address to each transmission in order to identify themselves as the source of the transmission.

[0004] Future networks are expected to be a hybrid between current cellular networks and current 802.11 networks, where the signaling is reduced greatly with blind detection of transmissions. For example, instead of a BS directly instructing UE on how to execute each transmission, UEs may be allowed to transmit autonomously in specific resource regions of frequency, time and/or code. Blind detection of transmissions may require the UEs to use some type of identifier so that the BS can identify the source of each transmission.

[0005] An issue with including a MAC ID (or similar identifier) in each transmission is that the signaling resource overhead can be quite large compared to the data transmitted, especially in cases where the amount of data transmitted is small. For example, a source identification (ID) may be 16 bits, 32 bits, 48 bits, 128 bits or even longer in length, whereas the data coming from a transmitter may be 20-30 bits (e.g. temperature reading). Even in blind or grant-free transmission networks (i.e., networks that do not use control messages to schedule/grant

transmissions), a certain amount of overhead is still used to explicitly signal and identify the source of transmissions.

SUMMARY OF THE INVENTION

[0006] These and other problems are generally solved or circumvented, and technical advantages are generally achieved, by preferred embodiments of the present invention which provide a system and method for transmission source identification.

[0007] In accordance with an ~~embodiment~~ aspect of the invention, a method includes receiving, by a first network device, a first transmission comprising an explicit first source identification (ID). The first source ID is added to a list of active source IDs. The first network device receives a second transmission. The second transmission does not include an explicit second source ID. The first network device determines the second source ID using the list of active source IDs.

[0008] In accordance with another ~~embodiment~~ aspect of the invention, a network device includes a processor and a computer readable storage medium storing programming for execution by the processor. The programming including instructions to receive a first transmission comprising an explicit first source identification (ID), add the first source ID to a list of active source IDs, receive a second transmission, and determine the second source ID using the list of active source IDs. The second transmission does not include an explicit second source ID.

[0009] In accordance with another ~~embodiment~~ aspect of the invention, a method for transmission source indication including transmitting, by a first network device, a first transmission comprising an explicit source identification (ID) of the first network device to a second network device. The first network device also transmits a second transmission, wherein the second transmission does not comprise the explicit source ID to the second network device. The source ID is embedded in the second transmission.

[0010] In accordance with yet another ~~embodiment~~ aspect of the invention, a network device includes a processor and a computer readable storage medium storing programming for execution by the processor. The programming including instructions to transmit, to a second network device, a first transmission comprising an explicit source identification (ID), and transmit, to the second network device, a second transmission, wherein the second transmission does not comprise the explicit source ID. The source ID is embedded in the second transmission.

BRIEF DESCRIPTION OF THE DRAWINGS

8. The method of claim 1, further comprising transmitting an acknowledgement to a third network device corresponding to the second source ID when the first network device determines the second source ID.
9. A network device comprising:
a processor; and
a computer readable storage medium storing programming for execution by the processor, the programming including instructions to:
receive a first transmission comprising an explicit first source identification (ID);
add the first source ID to a list of active source IDs;
receive a second transmission, wherein the second transmission does not include an explicit second source ID; and
determine the second source ID using the list of active source IDs.
10. The network device of claim 9, wherein the programming includes further instructions to set an expiration timer when a source ID is added to the list of active source IDs, and remove a source ID from the list of active source IDs when a corresponding expiration timer expires.
11. The network device of claim 9, at least a portion of the second transmission is scrambled with the second source ID, and wherein the instructions to determine the second source ID comprises instructions to descramble the portion of the second transmission using the list of active source IDs.
12. The network device of claim 9, wherein the second transmission comprises a data field and a data cyclic redundancy check (CRC) field, and wherein the data CRC field comprises a CRC scrambled with the second source ID.
13. The network device of claim 12, wherein the second transmission, a header field and a header CRC field.
14. A method for transmission source indication comprising:
transmitting, by a first network device, a first transmission comprising an explicit source identification (ID) of the first network device to a second network device; and

transmitting, by the first network device, a second transmission to the second network device, wherein the second transmission does not comprise the explicit source ID, and wherein the source ID of the first network device is embedded in the second transmission.

15. The method of claim 14, further comprising setting an expiration timer when the first network device transmits the first transmission, the method further comprising transmitting, by the first network device, a third transmission comprising the source ID to the second network device when the expiration timer expires.

16. The method of claim 15, further comprising receiving, by the first network device, an indication of a length for the expiration timer from the second network device.

17. The method of claim 14 further comprising re-transmitting, by the first network device, a third transmission when the first network device does not receive an acknowledgement signal for the third transmission before an acknowledgement timer expires.

18. The method of claim 14, wherein the second transmission comprises scrambled CRC bits, and wherein the method further comprises:

calculating cyclic redundancy check (CRC) bits for data transmission bits of the second transmission;

scrambling the CRC bits with the source ID; and

adding the scrambled CRC bits to the second transmission.

19. A network device comprising:

a processor; and

a computer readable storage medium storing programming for execution by the processor, the programming including instructions to:

transmit, to a second network device, a first transmission comprising an explicit source identification (ID); and

transmit, to the second network device, a second transmission, wherein the second transmission does not comprise the explicit source ID, and wherein the source ID of the first network device is embedded in the second transmission.

20. The network device of claim 19, wherein the first transmission comprises a cyclic redundancy check (CRC) field comprising a CRC of the first transmission, and wherein the

second transmission comprises a CRC field comprising a CRC of the second transmission scrambled with the source ID.

21. The network device of claim 19, wherein the first and second transmission each comprise a header and a header cyclic redundancy check (CRC).

22. The network device of claim 19, wherein the programming includes further instructions to:

set an expiration timer when the first transmission is transmitted; and
transmit, to the second network device, a third transmission comprising the explicit source ID when the expiration timer expires.

8. The method of claim 1, further comprising transmitting an acknowledgement to a third network device corresponding to the second source ID when the first network device determines the second source ID.
9. A network device comprising:
 - a processor; and
 - a computer readable storage medium storing programming for execution by the processor, the programming including instructions to implement actions in a method in accordance with any one of claims 1 to 8.
10. A method for transmission source indication comprising:
 - transmitting, by a first network device, a first transmission comprising an explicit source identification (ID) of the first network device to a second network device; and
 - transmitting, by the first network device, a second transmission to the second network device, wherein the second transmission does not comprise the explicit source ID, and wherein the source ID of the first network device is embedded in the second transmission.
11. The method of claim 10, further comprising setting an expiration timer when the first network device transmits the first transmission, the method further comprising transmitting, by the first network device, a third transmission comprising the source ID to the second network device when the expiration timer expires.
12. The method of claim 11, further comprising receiving, by the first network device, an indication of a length for the expiration timer from the second network device.
13. The method of claim 10 further comprising re-transmitting, by the first network device, a third transmission when the first network device does not receive an acknowledgement signal for the third transmission before an acknowledgement timer expires.
14. The method of claim 10, wherein the second transmission comprises scrambled CRC bits, and wherein the method further comprises:

calculating cyclic redundancy check (CRC) bits for data transmission bits of the second transmission;

scrambling the CRC bits with the source ID; and

adding the scrambled CRC bits to the second transmission.

15. A network device comprising:

a processor; and

a computer readable storage medium storing programming for execution by the processor, the programming including instructions to implement actions in a method in accordance with any one of claims 10 to 14.